

CLAIMS

- 5 1. An internal class representation data structure embodied in a computer readable medium, the internal class representation being suitable for use by a virtual machine at runtime, the internal class representation comprising:
- a first method; and
 - a reference cell that corresponds to the first method, the reference cell
- 10 including,
- a class pointer field that can be used to locate an internal representation of a class,
 - a method name field that contains or references the name of the first method, and
 - 15 a signature field that contains or references a signature associated with the first method.
2. An internal class representation data structure as recited in claim 1 wherein the reference cell further includes:
- 20 an information field arranged for containing or referencing information generated at runtime by the virtual machine; and
- a link field arranged to contain information suitable for directly or indirectly linking the reference cell to the internal class representation.
- 25 3. A data structure as recited in claim 2 wherein the reference cells are connected using a linked list construct.
4. A data structure as recited in claim 1 further comprising a plurality of said methods and a plurality of said reference cells, wherein each reference cell
- 30 corresponds to a unique one of the methods.

5. A data structure as recited in claim 1 wherein the signature is an internal representation of a signature that is directly usable by the virtual machine at runtime.

6. A virtual machine that includes a plurality of internal class representations as recited in claim 1.

7. A virtual machine as recited in claim 6, wherein at least some of the methods are invoked from multiple different internal class representations, but only one reference cell is provided for each unique method.

8. A virtual machine as recited in claim 7 wherein each internal class representation represents a Java class and does not include a Constant Pool.

9. An internal class representation data structure as recited in claim 1, wherein the internal class representation represents a Java class and does not include a Constant Pool.

10. An internal class representation data structure as recited in claim 1, wherein the first method is likely to be invoked.

11. An internal class representation data structure as recited in claim 1, wherein the first method is certain to be invoked.

12. In a virtual machine based computing system that uses internal class representations to represent class files, a process of loading a class files into the computing system comprising:

populating a first internal class representation that corresponds to the class file, wherein the populated first internal class representation includes at least one internal method invocation suitable for invoking an associated method; and

reviewing at least one method invocation to determine whether a reference cell currently exists for its associated method, wherein when it is determined that a reference cell does not currently exist for a selected method associated with the

method invocation, the process further comprises creating a new reference cell for the selected method, the newly created reference cell being associated with an internal class representation that contains the invoked method.

5 13. A process as recited in claim 12, wherein said reviewing is performed only when the at least one method is likely to be invoked.

14. A process as recited in claim 12, wherein said reviewing is performed only when the at least one method is likely or certain to be invoked.

10

15. A process as recited in claim 12, wherein the loaded class file further includes a Constant Pool and at least one class file method invocation that references the Constant Pool, the process further comprising translating each class file method invocation into an associated internal method invocation that references a selected
15 reference cell associated with the internal class representation that contains the method corresponding to the method invocation.

20

16. A process as recited in claim 12, wherein the computing system includes a virtual machine that utilizes the internal class representation to represent Java classes.

17. A process as recited in claim 12, wherein the internal class representation that contains the invoked method is different from the first internal class representation.

18. A process as recited in claim 12, wherein the internal class representation that
25 contains the invoked method is the first internal class representation.

19. In a virtual machine based computing system that uses internal class representations to represent class files, a process of loading a class file that includes a Constant Pool and at least one method invocation that references the Constant Pool
30 into the computing system, the process comprising translating at least one method invocation into an internal invocation that references a reference cell associated with the internal class representation that contains the method.

20. A process as recited in claim 19, wherein said converting is performed for each method invocation that is likely to be invoked.

5 21. A process as recited in claim 19, wherein said reviewing is performed for each method invocation that is likely to be invoked.

22. A process as recited in claim 19, wherein said converting is performed only for each method invocation that is likely to be invoked.

10

23. A process as recited in claim 19, wherein said reviewing is performed only for each method invocation that is likely or certain to be invoked.

0070361 10300
0070361 10300